

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A digital down-converter for converting a frequency of a digital signal, received at a radio receiver and sampled with a radio frequency (RF) or an intermediate frequency (IF), to a detection frequency for a detection process, comprising:

a first mixer for converting and outputting a frequency of the digital signal to a frequency of a first IF signal by multiplying the digital signal by a real signal;

a decimation filter for suppressing unwanted components among the frequency of the first IF signal from the first mixer; and

a second mixer for converting the frequency of the first IF signal having only wanted components outputted by the decimation filter to a second IF signal of the detection frequency, ~~and outputting the second IF signal as a complex signal by multiplying the output of the decimation filter by a complex local signal~~, the second mixer comprising:

a first selector for cyclically selecting and inverting signals from the decimation filter and outputting the second IF signal as a complex signal equivalent to a signal produced by multiplying the second IF signal by a multiplication value among cosine wave values of a the local signal; and

a second selector for cyclically selecting and inverting signals from the decimation filter and outputting the second IF signal as a complex signal equivalent to a signal produced by multiplying the second IF signal by a multiplication value among sine wave values of a the local signal.

2. (Original) The digital down-converter as claimed in claim 1, wherein a frequency of the first IF signal is $1/4$ a sampling frequency.

3. (Previously Presented) The digital down-converter as claimed in claim 2, further comprising an automatic gain control (AGC) amplifier for amplifying an output of the decimation filter and inputting the amplified output to the second mixer.

4. (Previously Presented) The digital down-converter as claimed in claim 2, wherein the second mixer further comprises a multiplier for multiplying the output of the

decimation filter by a certain ratio of a sampling frequency and a decoding means for decoding the multiplied signal through the multiplier.

5. (Currently Amended) A receiver comprising:

a digital down-converter including a first mixer for converting a frequency of a received digital signal, sampled with a radio frequency (RF) or an intermediate frequency (IF), to a frequency of a first IF signal by multiplying the digital signal by a real signal, and a second mixer for converting the first IF signal converted by the first mixer to a second IF signal of a detection frequency for a detection process ~~and then outputting the second IF signal as a complex signal by multiplying the first IF signal by a complex local signal;~~

an RF unit for receiving an input signal and providing the received signal to a third mixer;

a filter for attenuating an aliasing frequency component and an image frequency component of the first mixer in the digital down-converter, from an output of the third mixer; and

an analog-to-digital converter for sampling an output of the filter with a radio frequency or an intermediate frequency and providing the sampled signal to the digital down-converter;

wherein the second mixer further comprises:

a first selector for cyclically selecting and inverting signals from the decimation filter and outputting the second IF signal as a complex signal equivalent to a signal produced by multiplying the second IF signal by a multiplication value among cosine wave values of a the local signal; and

a second selector for cyclically selecting and inverting signals from the decimation filter and outputting the second IF signal as a complex signal equivalent to a signal produced by multiplying the second IF signal by a multiplication value among sine wave values of a the local signal.

6. (Original) The receiver as claimed in claim 5, wherein a frequency of the first IF signal is 1/4 a sampling frequency.

7. (Previously Presented) The receiver as claimed in claim 6, further comprising an automatic gain control (AGC) amplifier for amplifying an output of the first mixer of the digital down-converter, and wherein the first and second selectors are connected to the output of the AGC.

8. (Previously Presented) The receiver as claimed in claim 6, wherein the second mixer of the digital down-converter is constructed in a polyphase structure comprised of a decimation filter and a quadrature converter, and wherein the first and second selectors are connected to the output of the decimation filter.

9. (Previously Presented) The digital down-converter as claimed in Claim 3, the second mixer further comprises:
a multiplier for multiplying the output of the automatic gain control (AGC) by a certain ratio of a sampling frequency and a decoding means for decoding the multiplied signal through the multiplier.

10. (Previously Presented) The digital down-converter as claimed in Claim 2, wherein the first and second selectors are connected to the output of the decimation filter.

11. (Previously Presented) The digital down-converter as claimed in Claim 3, wherein the first and second selectors are connected to the output of the AGC.

12. (Previously Presented) The digital down-converter as claimed in Claim 10, wherein the first selector has multiplication values among cosine wave values as 1, 0, -1 and 0, outputs a multiplication result corresponding to a multiplication value '1', outputs a multiplication result corresponding to '-1' by inversion, and a multiplication result '0' corresponding to a multiplication value '0'.

13. (Previously Presented) The digital down-converter as claimed in Claim 11, wherein the first selector has multiplication values among cosine wave values as 1, 0, -1 and 0, outputs a multiplication result corresponding to a multiplication

value '1', outputs a multiplication result corresponding to '-1' by inversion, and a multiplication result '0' corresponding to a multiplication value '0'.

14. (Previously Presented) The digital down-converter as claimed in Claim 10, wherein the second selector has multiplication values among sine wave values as 1, 0, -1 and 0, outputs a multiplication result corresponding to a multiplication value '1', outputs a multiplication result corresponding to '-1' by inversion, and a multiplication result '0' corresponding to a multiplication value '0'.

15. (Previously Presented) The digital down-converter as claimed in Claim 10, wherein the second selector has multiplication values among sine wave values as 1, 0, -1 and 0, outputs a multiplication result corresponding to a multiplication value '1', outputs a multiplication result corresponding to '-1' by inversion, and a multiplication result '0' corresponding to a multiplication value '0'.

16. (Previously Presented) A digital down-converter for converting a frequency of a digital signal, received at a radio receiver and sampled with a radio frequency (RF) or an intermediated frequency (IF), to a detection frequency for a detection process, comprising:

- a first mixer for converting and outputting a frequency of the received signal to a frequency of a first IF signal by multiplying the digital signal by a real signal; and

- a second mixer for dividing the frequency of the first IF signal into a cosine part and a sine part and processing the cosine part and the sine part with a polyphase structure for converting and decoding to the frequency of a second IF signal by multiplying the first IF signal by a complex local signal, the second mixer comprising:

 - a selector for selecting and inverting signals from two decimation filters for suppressing an unwanted signal of respectively inputted signals.

17. (Previously Presented) The digital down-converter as claimed in Claim 16, wherein a frequency of the first IF signal is $\frac{1}{4}$ a sampling frequency.

18. (Previously Presented) The digital down-converter as claimed in Claim 17, further comprising an automatic gain control (AGC) amplifier for amplifying the output of the first mixer and inputting the amplified output to the cosine part and the sine part of the second mixer.

19. (Cancelled)

20. (Currently Amended) The digital down-converter as claimed in claim 16, wherein the second IF signal is represented by

$$f_2(t) = (1/2) f_1(t) (e^{jn(\omega_{d1} - \omega_{c1})t} - e^{jn(\omega_{d1} - \omega_{c1})t})$$

$$\underline{f_2(t) = (1/2) f_1(t) (e^{jn(\omega_{d1} - \omega_{c1})t} + e^{-jn(\omega_{d1} - \omega_{c1})t})}$$

where $f_1(t)$ is the first IF signal and t is time.